

GOODELL (Wm.)

CLINICAL MEMOIR

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TURNING IN PELVES NARROWED IN THE
CONJUGATE DIAMETER.

BY

WILLIAM GOODELL, M.D.,

PHYSICIAN-IN-CHARGE OF THE PRESTON RETREAT; CLINICAL PROFESSOR OF THE
DISEASES OF WOMEN AND CHILDREN IN THE HOSPITAL OF THE
UNIVERSITY OF PENNSYLVANIA, ETC.

Read before the Philadelphia Obstetrical Society, February 4, 1875.



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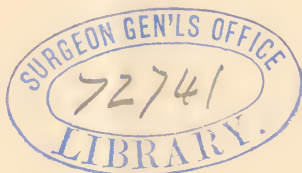
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ALTHOUGH on account of the size of her offspring the daughter of Orchomenos died in travail; and although, as Homer sings, Latona was nine days and nine nights in giving birth to Apollo—

Λήτω δ' ἐννῆμάρ τε καὶ ἐνέα νυκτας ἀέλπτοισ
Ὠδίνεσσι πέπαρτο;—

it does not appear that their celestial paramour devised any mode of relief for such contingencies. Nor did his ox-eyed consort, who was the tutelary divinity of pregnant women. Nor did other erring gods and goddesses, not even Latona herself, who, in the end, became a powerful deity. To Aspasia, the mistress of Cyrus the Younger, was reserved the honor of suggesting the induction of labor in women unfit to bear; and to Moschion, a physician of the second century, that of resorting to version whenever the labor is a difficult one.*

These golden hints appear, however, to have faded from view; for in the fifth century, we find Aëtius, the first of Christian medical writers, reviving the teachings of Aspasia (*Tetrabib.* 4, *Sermo* iv., *cap.* xviii.); and, in the seventh century, Paulus Ægineta, surnamed Obstetricus from being the first “man-midwife,” refuting the aphorism of Hippocrates that breech presentations are generally fatal to both mother and child. But printing was yet an undiscovered art, and these dawning thoughts lay fallow. At intervals of time, men endowed with great originality, such as Paré, Guillemeau, and Manriecan, throw out hints that in isolated cases of labor, they resorted to version; but from these scattered observations no general laws were deduced. According to Brudenell Exton (*New System of Midwifery*, 1751), even the brothers Chamberlayne gained their reputation, not so much from the use of the forceps as from the operation

* Περὶ τῶν γυναικείων παθῶν, in I. Spachii *Gynæciorum Harmoniâ*, Argentinæ, 1597.

of version—which in their day was little known. Influenced by their example, Sir Fielding Ould (*Treatise on Midwifery*, Dublin, 1742) taught his pupils, that in contracted pelves a delivery by podalic version is easier to the mother and safer to the child. His able cotemporary, Paul De Wind of Holland (Sue's *Essais Historiques des Accouchemens*, vol. ii. p. 394), vehemently proclaimed the inferiority of the forceps to version. Even John Burton, the Dr. Slop of Tristram Shandy, so far forgot his learning and his breeding as to abuse Smellie and his forceps in a tirade, which in bitterness was surpassed only by that of the midwife and Amazon, Nihell. But the partisans of the forceps prevailed, and the manual delivery in faulty pelves appears to have been forgotten until 1847, when the genius and the enthusiasm of Simpson brought about its great revival.

Notwithstanding the weight of authority at the present day undoubtedly leans toward podalic version in pelves narrowed in their conjugate diameter; yet the question of its utility is still an open one, and this operation has not yet become an undisputed canon of obstetrics. Men of high standing in the profession, such as Byford of Chicago, Martin of Berlin, Radford of Manchester, Dnnean of Edinburgh, and Depaul of Paris, look with disfavor upon it; while the great mass of the profession on this continent, influenced by the teachings of Hodge and of Meigs, and by their own unrivalled skill in the use of the forceps, regard a safe delivery of the child to be impracticable, whenever that instrument fails to extract it. In view of this perplexing discrepancey of opinion, the object of this paper will be to give my own personal experience, and to discuss the question as soberly and dispassionately as a new convert and a warm partisan can.

The advocates for the use of the forceps in narrow pelves contend—

1st. That the neck of the child cannot sustain much traction, and that, consequently, the degree of tractive force which can be safely exerted by the forceps, far surpasses any extractive power which can be brought to bear upon the after-coming head.

2d. That during traction by this instrument, moulding of the head is a gradual process, and may go on in safety for an indefinite length of time. But, after version, moulding cannot take place, because death ensues if the delivery is not very rapidly effected.

3d. That when version fails to deliver, the subsequent operation of craniotomy or of cephalotripsy is a more difficult one than when the forceps fails.

These are the stock arguments against version. But the main reason which, I think, influences the profession at large against this mode of delivery, is their habitual ill-luck in ordinary breech-eases, and also their fear lest the neck should part and the head be stalled in the uterine cavity.

The arguments in favor of version may be summed up as follows :—

1st. In cephalic presentations the head usually lies in the transverse diameter of the brim, and does not tend to dip. It presents by its vault, which is, therefore, flattened out and made broader by the resistance at the brim.

2d. The forceps as generally applied catches the unflexed head usually in the occipito-frontal diameter, exceptionally in the fronto-mastoid diameter. In either case the compression made by it causes the head to bulge out laterally, hence to overcome this mechanical disadvantage very great brute force is needed.

3d. When the promontory of the sacrum is laterally displaced and the brim unsymmetrical, should the vertex present in the contracted side of the pelvis, it may, by traction on the proper foot, be turned around and brought into relation with the more roomy side.

4th. By version the small end of the cranial wedge—viz., the unyielding base—is the one which first enters the brim. From this mechanical advantage there is gained a maximum of lateral compression of the upper, thinner, and wider portions of the skull; in other words, the bones bend in and overlap better.

5th. Clinical observation conclusively proves that the unflexed after-coming head is nipped, not in its biparietal diameter, but in the small end of the fronto-parietal cone or wedge, viz., the bitemporal diameter, which is from half an inch to three-quarters of an inch shorter. The biparietal diameter passes through to one or the other side of the conjugate diameter. From this mechanism of descent less extractive force is needed, and the time necessary for delivery is thereby much abridged.

6th. The bilateral compression gained by version is the least dangerous to the life of the child. On the other hand, the occipital blade of the forceps may destroy life by pinching the cord when coiled around the neck, or by too great and too prolonged a pressure on the medulla oblongata.

7th. The jutting promontory so protects the cord from pressure that after version the necessity for immediate delivery is not so urgent as in ordinary breech eases.

8th. The child's neck can sustain with impunity a very great

strain, and if to this be conjoined, by the hands of an assistant, a propelling supra-pubic pressure upon the vault, fully as great an extractive power can be brought to bear upon the after-coming head as by the forceps in head-first labors.

9th. Provided the brim is wide enough to admit the hard base of the skull, the operation of craniotomy or of cephalotripsy is quite as easy in the one as in the other mode of delivery. The brain can be reached by perforating the roof of the mouth, the skull behind the ear, or, what is the point of election, the suboccipital region. Moreover, the base can be more readily grasped and crushed by the cephalotribe. When the brim will not admit the cranial base, the difficulties attending craniotomy and cephalotripsy are perhaps greater, but by no means insuperable.

10th. Since by version the narrow conjugate is traversed more quickly, the passage of the child's head is attended with less risk of injury to the mother's tissues.

11th. After craniotomy turning is often a very efficient way of completing the delivery.

12th. By the induction of premature labor conjoined with version, living children can be delivered through pelves so narrow as otherwise to demand craniotomy.

From arguments so conflicting truth can be sifted out, not by fireside theories and closet speculations, but by an appeal to bedside experience. Let us study them in that light. The following illustrative cases are not all that I can offer, but they are perhaps the most salient ones. From them I shall also exclude all cases of original breech-presentations in narrow pelves, of which I have seen several.

CASE I.—My first case of turning in a narrow pelvis was forced upon me by a prolapse of the cord. Had not this accident happened I should have resorted to the forceps. So far as the life of the child is concerned it was a failure, but in other respects it afforded me much food for reflection. A. K., æt. 25, bore her first child in 1863. She was, as she alleged, four days in labor, and had in attendance two physicians of experience. After many hours of hard tugging at the forceps they finally delivered her by craniotomy. Since that time fruitful intercourse had for six years been prevented by some one of those vile measures so much in vogue at the present day. Through very unwelcome carelessness she again became pregnant, and on March 27, 1870, fully up to term, she fell into labor and into my hands. I found the brim kidney-shaped, the promontory easily reached by my short index finger, and the

unruptured bag of waters filled with a large coil of the cord. To replace this, the postural and other methods were in vain tried both before and after the membranes broke. Half an hour after the waters had drained off the child was turned by the bimanual method. Much force was needed to extract the head, but it was not made as promptly and as efficiently as I have since learned to make it. The head passed the brim with a jerk, and was thereafter easily delivered, but the child was still. It weighed eight pounds five ounces. Here was a pelvis whose conjugate diameter measured less than 3.5 inches, and yet the delivery was comparatively easy and short. From a pretty large experience with flat pelvises I was satisfied that had the forceps been applied, one hour or more would have elapsed before so large a head could have been made to pass the narrow brim—perhaps not without craniotomy.

CASE II.—On this occasion your President and I were called in by the attending physician to a desperate and ultimately fatal case of puerperal eclampsia. Vain attempts to deliver were made with the forceps. With extreme difficulty version was performed, but after its completion the delivery was comparatively easy. The child was dead, and weighed exactly thirteen pounds, being the largest one that I have ever seen. Strictly speaking, this was not a case of narrow pelvis; but it was one of disproportion between the pelvic diameters and those of the head, and as such I report it to prove the superiority of version over the forceps.

CASE III.—This case was also one of compulsion and not of choice. M. McC., æt. 27, had in her previous labor been prematurely delivered at the end of the seventh month of gestation. The child weighed less than five pounds, and yet her labor lasted over forty-eight hours, six of them being attended with great suffering and violent expulsive pains. Her physician recognized the conjugate contraction, and in her second pregnancy urged upon her the induction of premature labor. Upon her refusal to submit to this operation he declined to attend her, and she sought admission into the Preston Retreat. At 8 o'clock A. M., June 8th, 1870, after labor had lasted ten hours, I found the waters dribbling away from an unexpanded os. The head, presenting the occiput to the left ilium, could not bear upon the cervix, but rolled about upon the shelf formed by the promontory. By careful measurements the conjugate diameter of the brim was estimated at a trifle over three inches in length. At 3 o'clock P. M., finding her condition unchanged, I decided to dilate the os with the water-bags and apply the forceps to the sides of the head. While preparing to do so, the

woman suddenly began to twitch in her muscles, to start convulsively, and to complain of blindness and intense headache. Fearing an attack of eclampsia, I decided to turn. The woman was accordingly etherized, brought down to the edge of the bed, and each hip supported by a nurse. Two fingers of the left hand were then squeezed into the os, and ultimately, a third. By these, in conjunction with the external use of the right hand, version was made with so little effort that I did what I have never before nor since done; I turned the child more than half a circle and had to reverse the process. One foot having been dragged down, time was given for the os to dilate before the body and arms were brought down. By then following a method which I had previously found of advantage, and which will be hereafter described, I quickly delivered the child. It was asphyxiated, but promptly recovered. It had a deep furrow on the right side of its head, and weighed seven pounds and twelve ounces.

CASE IV. was the first one in which I turned from choice. Late in the evening of January 15th, 1871, F. K., an undersized primipara, aged 31, was admitted, having already been in labor twenty-nine hours. Her last catamenia ended April 15th, so that she was fully up to term. I found the waters drained off, the conjugate diameter somewhere about three inches and a half, and the occiput looking directly towards the left ilium, but not bearing at all upon the cervix. Having lately had a series of tedious forceps cases, I felt much inclined to try version. Wishing, however, some backing, I sent for my friend, Dr. E. L. Duer, who verified my measurements and sustained me in my decision. I accordingly turned by the bipolar method, and at once proceeded to deliver. Dr. Duer pushed down the child's head from above, while I, by three short movements of traction, extricated it without the slightest delay. The child weighed five pounds and fourteen ounces, was born lusty and did well, although bearing on its right temple a slight depression, such as that great military surgeon, Ambrose Paré, aptly compared to the bruises which a silver kettle-drum receives when thrown on the ground. Nine days after, the mother accidentally discovered a dislocation of the acromial end of the left clavicle, which I should like to believe was a congenital deformity.

CASE V.—On December 16th, 1871, E. R., a dwarf in size and in wretchedly bad health from phthisis, applied for admission to the Retreat on account of the severity of her three former labors. In her first labor the late Prof. David Gilbert, whose skill with the forceps is well known, tugged away at that instrument for five hours,

and delivered her of a badly marked but living child. In her second pregnancy she refused to have labor induced, and went to term. This time he kept the forceps on for nine hours, and after lashing the handles, delivered her of a dead child with its head badly crushed in. He now told her that hers were the two most difficult labors he had ever seen, and vowed never to attend her in another. Again she became pregnant, but kept this fact concealed from him until labor set in. Upon great entreaty he very reluctantly consented to attend her; had the forceps on for three hours, and delivered her of a living but small and badly marked child. Following each one of these labors a smart attack of peritonitis kept her in bed for four weeks after the first two, and for three weeks after the last one. After each one also, the catheter was needed for several days. Her husband now died, and she remained a widow for several years; then married again, and soon found herself pregnant for the fourth time.

Upon her admission I carefully examined the pelvis. My index finger easily touched the sacro-vertebral angle, and gave a length of four inches to the diagonal conjugate, and therefore, one of 3.32 inches to the true conjugate. Labor was not induced because she was very near her time. Four days later she went into a slow labor, with the occiput to the left ilium. After nine hours the membranes broke prematurely. The expulsive pains then increased in severity until in three hours more they became, as my note-book states, "terrific." Yet the os did not dilate, and the head remained moveable above the brim; I, therefore, gave her ether, turned the child and delivered it alive in less than three minutes after strong traction and propulsion had been begun. It was a well-nourished girl, weighed seven pounds ten ounces, and bore a deep pressure-mark in front and above the ear.

So impressed was this woman with the advantages of turning over those of the forceps, that on March 10th, 1874, she struggled against great difficulties in order to put herself again into my hands. She was then bed-ridden, and desperately ill with pulmonary hemorrhages and hectic fever. Her friends daily expected her death; but by tears and entreaties she prevailed upon her husband to carry her to a hack, in which, lying on his lap, she was conveyed to the Retreat. On entering the building she went off into an eclamptic fit. This time I turned through the membranes by two fingers, then ruptured them and in my usual manner forcibly delivered her of a plump and lively boy. It weighed six pounds fourteen ounces, and bore the same kind of a pressure-mark as its sister. From the former labor

as well as from this one, her recovery was much retarded by her constitutional disease, but in nowise from the effects of the labor. I thought her dead and buried, when, to my astonishment, in January last she feebly walked into my room at the University and sought my advice for an abdominal tumor. My assistant, Dr. D. Bray, and myself carefully examined her. We both easily touched the promontory with our index finger, and found the tumor to be a gravid womb. She at once got an order of admission to the Retreat, and I am daily expecting her to be brought in.

CASE VI.—Some time in 1873, the month and day I cannot recall, my friend Dr. R. B. Cruice asked me to see one of his patients, whom he had delivered some three or four times, but always of large children, and, on each occasion, after a tedious use of the forceps. She was again in labor, and he had several times applied and reapplied the Hodge forceps; but after powerful traction the blades invariably slipped. I found a very fat woman in hard labor. The pelvis was unusually deep and somewhat narrowed. The head was perched above the brim, with the occiput looking towards the left ilium. Failing to get the blades over the sides of the head, I had to content myself with their oblique application; but the head being a large one, they did not hold well, and we therefore decided to turn. The operation of version was by no means as easy as the subsequent delivery. The child was alive and unusually large. The mother's convalescence was retarded by a sharp attack of peritonitis—then prevailing as an epidemic—but she eventually did well.

CASE VII.—Not long ago I exhibited at a meeting of this Society the body of a child which I by version had a few hours previously delivered through a very narrow pelvis. The remarks which I made on that occasion were not reported in the *Transactions*, because due notice of the intended presentation of the specimen could not be conveyed to the members in advance of the meeting. This case I shall therefore now report at length.

On March 13th, 1874, M. S., a native of Germany, sought admission into the Retreat on account of her previous very difficult labors. She was forty years old, and had been married twice in eighteen years. Both she and her twin sister were reared on the bottle; they cut their teeth very late, and neither could stand on her feet until after she was two years old. Both married, and both became pregnant; but the sister could not give birth to her child, and died after being delivered by the Cæsarean section. M. S.'s first labor took place in Germany, the child presenting by the head. After many hours of hard labor, the midwife in attendance foreseeing

trouble sent for a physician, who broke up the vault but failed to extract the child. A second physician was called in, and finally three more before she was delivered. So much difficulty was experienced that one arm was torn off with the blunt hook.

Her second labor took place also in Germany. The fœtus could not have been much older than the fifth month of utero-gestation; for, according to her description, "it had no nails on its fingers or on its toes," yet the labor was a very tedious one. Her husband now dying, she remained a widow for a number of years, then married again, and emigrated to this country. Her third labor happened in a small hamlet in the interior of Pennsylvania. The attending physician being too far removed from any other to call in help without much delay, pluckily took charge of the case single-handed. After breaking up the head and working over the case for the better part of a day and a night, he succeeded finally in delivering the woman of a fœtus so mutilated as, to borrow the language of her husband, "no longer to look like a child." In 1872 her fourth labor occurred; this time in one of the suburbs of this city. The arm presented; it was torn off, and so was a leg, before the child could be turned and delivered. According to the husband's statement, no instruments were used, yet the child's head was crushed in.

She told me that her catamenia were last seen in the middle of June, and that she was daily expecting her confinement. Owing to this statement, and also to the prevalence in Philadelphia of an epidemic of puerperal fever, labor was not induced, as it should have been. On March 31st, at 10 A. M., she fell into labor, and I now, for the first time, examined her pelvis. The head presented transversely, with the occiput looking towards the left ilium. With my index finger, Earle's pelvimeter, a carpenter's rule, and a pair of callipers, I obtained the following measurements, to which, for the sake of comparison, Schroeder's measurements of the standard pelvis are appended:—

| | <i>Pelvis of M. S.</i> | <i>Standard Pelvis.</i> |
|------------------------|------------------------|-------------------------|
| Between crests of ilia | 9.5 inches | 10.75 inches. |
| External conjugate | 6. " | 7.8 " |
| Diagonal conjugate | 3.5 " | 5.01 " |
| True conjugate* | 2.82 " | 4.33 " |

Having satisfied myself that the child was rather under than over the average size, I decided to turn. After ether was administered,

* The true conjugate is found by subtracting Schroeder's correction of .68 of an inch from the diagonal conjugate.

I passed in my left hand and made a more careful examination. The transverse diameter of the brim seemed ample, but, to my surprise, I could not pass the breadth of my hand through the conjugate without painful squeezing. Now I happened to know that my hand, with some compression, measures just 2.5 inches across the knuckles. To explain the discrepancy between my outward measurements and this internal one, I made further exploration, and found it to be owing to two sharp ridges of bone projecting inwardly along each edge of the pubic symphysis. This somewhat staggered me in my intention to turn; but, upon reflecting that in her last labor, that of an arm presentation, the head was not perforated; and also, that from the shallowness of the pelvis, the difficulties of craniotomy would not be much enhanced, I decided to go on. I turned through the bag of waters, then broke it, and seized both feet; but found there was not room enough to bring them down. I therefore let go the right foot and coaxed down the left one by hooking two fingers over the instep. Very powerful traction was needed to pull the half-breech and the chest through the brim. Finding the child still alive, I at once brought down the arms, and proceeded to extract the head. By a propelling power of about fifty pounds on the vault of the head, and a tractive weight of not less than one hundred and twenty pounds on the child's neck, aided finally by a pump-handle movement of traction on its legs, a dead child was born in exactly twenty minutes after the rupture of the membranes. Its neck was unbroken, but there was a vertical groove on the pubic side of the head, and on the opposite side a deep depression and fracture of the parietal and frontal bones. The bottom of this indentation lay above the ear but in front of it and in a line with its tragus. The bitemporal diameter at the seat of fracture measured 2.5 inches. The child weighed six pounds twelve ounces. The woman did not need the catheter, was up and dressed on the fifth day, and left for home on the twelfth. Had the cephalic presentation been retained, and craniotomy been resorted to in this case, the operation would, without doubt, have been a tedious and a dangerous one.

CASE VIII.—Early in July, 1874, E. B., a very short woman, aged 18, and two years married, applied for admission to the Retreat on account of her previous labor, which had lasted three days. Three physicians were in attendance; two of them men of large experience. After repeated and prolonged trials with the forceps, they finally delivered her by craniotomy; but not soon enough to prevent the mishap of a large vesico-vaginal fistula. The excoria-

tion of her person from the constant dribbling of urine, her nervous apprehension and dejected appearance, made her a very pitiable object. Her catamenia ended on November 28th, 1873, and she was therefore urged to come in at once, in order, if needful, to have premature labor induced. This advice, as I afterwards learned, frightened her, and she went home with the intention of staying out until labor set in. Meantime I daily expected her to enter the building, and on that account kept putting off my summer vacation. On the afternoon of August 13th, my friend, Dr. Jacob Roberts, who had kindly undertaken to look after my patients during my absence, called to ask why I did not go away. While I was explaining to him the cause of my stay in town, the door-bell rang and the woman herself came in. Finding her in labor and the os well dilated, I at once impressed Dr. Roberts into service and put her under ether. The vagina was somewhat narrowed by a cicatricial band. The conjugate was over three inches in length, but under three and a half. A closer measurement than this I cannot give, because I unfortunately neglected to verify my finger measurement by a carpenter's rule. The pelvis was uniformly contracted; yet there seemed room enough in the bisiliac diameter to admit the occipito-frontal diameter of an average child's head, and I accordingly decided to turn. As soon as the arms were brought down, Dr. R. made suprapubic pressure with all his might, while I threw on the child's neck all of my weight possible in a bent posture. A distinct snap of some cervical structure was felt and heard. In less time than it has taken me to describe the process, the head bounced out of the grip of the brim. After a short but anxious detention at the cicatricial band, a living and lusty child was born. It weighed five pounds six ounces, and, apart from a slight depression on the side of its head, appeared none the worse for the rough treatment it had received. As soon as the mother had recovered her senses, and had heard the cries of her child, she seized my hand in both of hers and covered it with kisses. I mention this incident, not from any lurking feeling of sentiment, but from a wish to show how vivid was the memory of her former labor, and how keen was her sense of gratitude. The extractive power applied to this case, I rate at not less than 200 pounds. Of this amount Dr. Roberts exerted about 90 and I not under 110 pounds. The necessity for this great force was owing, not so much to the narrow conjugate, as to the general contraction of the pelvis. The mother's convalescence was so prompt that on the fifth day she was dressed, and on the twelfth she went out as a wet nurse.

CASE IX.—Since this paper was read before the Society, the following case has happened to me. Late in the summer of 1873, E. O'N. æt. 32, fell into labor with her first child. Dr. James F. Wilson, being in attendance, put the forceps accurately on the sides of the child's head, and, for an hour, pulled away in vain. He then sent for Dr. J. S. Parry, who arrived at 5 o'clock P. M. After trying for several hours to deliver her with the forceps, they succeeded finally at midnight, after a tedious craniotomy operation. I give the names of these gentlemen as a sufficient voucher to the members of this Society that the fullest toll of service was exacted from the forceps. The woman's water had to be drawn off twice daily for two weeks thereafter, and her convalescence was a slow one.

On the 10th of February, 1875, she again fell into labor, and Dr. Wilson asked me to see her. We found the expulsive pains very severe, the waters drained off, the os dilatable, the head movable, and the vertex to the left ilium. A very careful examination gave a diagonal conjugate of 3.5 inches, making the true conjugate 2.82 inches in length. At 10.30 o'clock P. M. the forceps was very accurately applied by Dr. Wilson to the sides of the head. For precisely one hour he and I, by turns, tugged faithfully at the handles without gaining the slightest descent. In order to get the full benefit of the woman's expulsive efforts, ether was withheld. At 11.30 o'clock the forceps was removed, ether now given, and the child turned. Very unfortunately the feet came down astride of the cord. This mishap made me hurry up matters, and in my haste to deliver the pubic (right) arm I broke the clavicle. Dr. Wilson, who was supporting one of the woman's knees, made strong supra-pubic pressure with one hand, while I put on the neck a few pounds more than half the weight of my body. Within two minutes after the arms had been brought down, and before the clock struck twelve, the child was born. It was asphyxiated, but soon began to cry, and weighed eight pounds six ounces. Adjacent portions of the frontal and parietal bones above and in front of the left ear were greatly flattened. In the centre of this area was a spoon-shaped depression with probable fracture into which I could lay my thumb. Fourteen hours later Drs. Wilson and R. G. Curtain met me at the house of the patient. She was doing well and had passed her water. In spite of its concavo-convex head, the child seemed lively enough. At that visit I measured the diameter of its head at the site of the fracture. Although the bottom of this lesion had now become very nearly flush with the flattened surface, and the latter had very appreciably rounded out, the calipers gave a measurement of 3.15 inches

A smaller measurement than this could have been got, for the bones were very yielding, but the child winced at the gentle contact, and I did not dare to use the slightest compression. The clavicle was dressed by a pad in the axilla, and by three adhesive straps. By the evening of the 27th inst., the bones were so well knit that all the dressings were removed. At this date the left side of the head was still more flat than its fellow, but the difference was not so marked. With the exception of a strain of the right hip-joint, caused from spreading the thighs too widely while the forceps were in use, the mother did well.

Honesty demands that I should now relate a case of failure to deliver by version. It is thus far my only one. C. K. was for the first time delivered in December, 1873, by a skilful physician, after an extremely difficult forceps labor. The child was dead; its face and skull so crushed in that the husband would not permit his wife to see the body. Becoming again pregnant she fell into my hands. At 10 o'clock P. M., December 19th, 1874, labor began. At 7 A. M. of the next day, the waters gushed away from a well-dilated os. Yet after an hour and a half of strong pains the head did not offer to engage, but remained perched so high up that, by introducing two fingers, I could just touch it. The woman begged so hard not to be anæsthetized, that I was weak enough to yield to her wish. The parts were consequently too sensitive to permit of accurate measurements. Misled by finding the conjugate fully 3.5 inches in length, I overlooked a uniform contraction of the whole pelvis, and did not discover my mistake until it was too late to mend it. The head lay in the first position of the vertex, with the posterior fontanelle so high up that the introduction of four fingers was needed to reach it, and yet it was lower than the anterior fontanelle. By burying the lock in the vagina, the forceps was readily applied obliquely, but the depth of the pelvis and the woman's resistance prevented a biparietal application. Strong traction for half an hour doing no good, the child was turned. The half-breech was dragged through the pelvis with so much resistance, that it augured badly for the safe extraction of the head. For half an hour before the brim was passed, I hung on the neck all the weight I dared, fully 130 pounds. The trouble lay in the want of room in the bisiliac diameter. The head neither flexed nor rotated, although the child being now dead, due moulding time was given in the intervals of traction. After the lapse of another half hour I felt the spinal column give way, and, therefore, opened the skull behind the right ear. As soon as the brain was broken up, one finger was hooked

into the opening and the head turned out with so little trouble, that it was by far the easiest ease of craniotomy I ever had. The child, a boy, less a few drachms of brain, weighed eight pounds eight ounces; its head was large and firm.

It is worthy of note, that in this unsuccessful case, as well as in the ten preceding successful ones, and also in others which I have not reported, all the women, excepting the one with eclampsia and the one attacked by peritonitis, recovered as promptly from the effects of the labor as if it had been a natural one. Further, in no single instance that I can recall, was the catheter needed to empty the bladder.

From the foregoing cases it will also be seen that not only were infants very speedily born through narrow pelves; but that some of them were born alive after very powerful traction upon their necks, and indeed, after the forceps had failed. Five questions at once suggest themselves: What amount of traction on a child's neck is compatible with life? What amount, without decollation? What amount of extractive power can be brought to bear upon the child as a whole? What is the mode of traction? What is the limit of conjugate narrowing through which an average-sized head can be made to pass?

In a paper on the "Management of Head-Last Labors," which was read before the Philadelphia County Medical Society (*Philadelphia Medical Times*, March 20, 1875, p. 385), and of which this one is a pendant, I stated that a strong opponent to version, Matthews Duncan, had found the neck of a mature infant capable of sustaining an average weight of 105 pounds before the spinal column yields, and one of 120 pounds before the body parts from the head. That these averages seemed to me to be underrated, for, from a series of experiments, I found that, while I rarely exerted a force of over 100 pounds, I had on several occasions delivered living children after throwing on their necks a weight of 130 pounds. I further showed that Joulin, also a warm partisan of the forceps, after putting on the feet of three dead children a steady traction power, respectively of 125, 145, and 148 pounds, had dragged their heads through an artificial pelvis without breaking their necks. In that paper I cited a remarkable instance, in which a well-known physician of this city, by bracing his feet against the woman's person, had exerted his utmost strength on the neck of a child without any lesion whatever.

Twice have I delivered living children, and one of them actually lusty, after using so much force as to cause a very audible snap of

some cervical fibre—an experience which tallies with that of Braxton Hicks, Steele, and of others who took part in the discussion on Dr. Dunean's paper (*British Medical Journal*, September 19, 1874, p. 384). Although exerting all the manual strength at my command, I have never seen the body part from the head. Nor in three instances, including one of breech-presentation, was there the slightest appreciable injury to the neck, although the sacral side of the head had been broken in. On one occasion only had the perforator to be resorted to, and, as before stated, it was by far the easiest operation of the kind that I ever performed. Further: it must not be overlooked that the neck of a living child is presumptively stronger than that of a dead one. For aside from the vital contractility of the muscles and the ligaments, there is on the part of the child, as my friend Dr. Isaac S. Eshleman has called to my attention, an invariable resistance to traction, whereby a very marked shrinkage takes place in the muscles of the neck.

By a series of experiments with his dynamometer, Joulin* found that, without any brace for the feet and by pulling with the muscles of the arms alone, a robust (*vigoureux*) man can exert on the forceps a force of 113 pounds. When the feet take a purchase on the floor, a force of 150 pounds may be reached. When the physician braces his feet on the edge of the bedstead, a force of 225 pounds is attainable. Including even this last mode of traction, which, if prolonged, is hardly ever compatible with the life of the child or with the integrity of the mother's tissues, the conclusion is inevitable, that, by the conjoint use of two very nearly equal forces, viz., that of supra-pubic pressure by the hands of an assistant, and that of traction on the body of the child by the physician, there can be safely brought to bear upon the hind-coming head an extractive force fully as great as that by the forceps on the fore-coming head. Thus, in Case VIII. Dr. Roberts and myself together exerted a force of certainly not less than 200 pounds. In Case IX. Dr. J. F. Wilson's *vis à tergo* and my *vis à fronte* must, unitedly, have equalled fully 150 pounds. For want of a better place, let me here say that the supra-pubic pressure possesses another helpful property beside that of propulsion. If directed downward and backward, as it should be, it flattens the head bilaterally against the sharp edge of the promontory.

If now, to an extractive force fully equal to that of the forceps, be added the great mechanical advantage gained by getting the

* *Traité Complet d'Accouchements*, p. 1063.

small end of the wedge, viz., the cranial base, to enter the inlet; and also that gained by the engagement in the conjugate of the small bitemporal diameter; and if to these very substantial advantages be superadded the telling mechanism of delivery in version, by which only one small portion of the skull is compressed, and that where most needed, viz., in the offending diameter itself of the child's head, while by the forceps the compression is diffused over large surfaces, on unimplicated diameters, and consequently in more or less direct antagonism to the line of compression made by the symphysis and the promontory—it follows that the weight of argument in favor of the manual over the instrumental operation is overwhelming.

Notwithstanding the foregoing facts show the wonderful tensile strength of the foetal neck, and the great amount of force that can safely be used to extricate the after-coming head from the grasp of the brim; it is of importance to exert the power to the best mechanical advantage, and to grade it to the resistance. This brings me to the mode of making traction. But since the question of version in narrow pelvis hinges on that of the management of head-last labors, I shall take the liberty of quoting somewhat freely from my paper on that subject.

In the first place the woman's hips should be brought slightly over the edge of the bed and each leg supported by an assistant. My reasons for this position in preference to the lateral one are: That supra-pubic pressure is then better made by the hands of a third assistant, or by the free hands of the two assistants. That very few physicians, while bending forward in front of the woman thus placed, can exert a steady force of one hundred pounds upon the neck of the child; and, finally, that the upper hand of the physician can then force the neck into the hollow of the sacrum, and thus make the line of traction somewhat behind the axis of the superior strait.

In a brim narrowed in its conjugate, the sacral side of the after-coming head is bent in and fixed by the jutting promontory. Hence, as Barnes has shown, the extrication of the head as a whole can take place only when its pubic side revolves around the promontory and descends over the smooth undersurface of the symphysis of the pubes; in other words, the head must be warped around the promontory. Bearing this fact in mind, it is important after version, that the sacral side of the head should be caught at a point as near as possible to its vault. To gain this end, the physician, after grasping the nape of the neck with one hand and the

ankles with the other, should make his first movement of traction in the axis of the outlet. For then the pubic side of the head will be tilted away from the inlet, while the sacral side will proportionally descend over the promontory and affront the brim. This canting of the head can be very materially aided by the free hands of the assistants, who will make very firm downward and backward pressure upon the vault of the head through the now flaccid abdominal walls. By these manœuvres the sharp promontory is made to indent the sacral side of the head at a point still higher up and nearer to the vault. Hence, the arm of the lever, measured by a line drawn from the base of the skull to this fixed point, will be correspondingly lengthened—a mechanical advantage not to be overlooked. If now, *without for a moment remitting but rather increasing the traction*, its direction be reversed, and the child's body be swept backward upon the coccyx—the neck being also forced downward and backward into the hollow of the sacrum with all one's power—the sacral side of the head becomes bent in, and the pubic side is made to revolve around the promontory, and descend with the least expenditure of power. Apart from the leverage thus gained, and the shorter arc thus described around the promontory as the centre of motion, I am not sure but this manœuvre will, in very narrow pelves, so cant the cranial base as to get it below the sharp edge of the promontory. This much I can affirm: That by this method less power is needed to deliver average heads in narrow pelves than large heads in average pelves. For, in the former, the resistance is limited to a single osseous point; in the latter, diffused more or less over the whole bony brim.

Whenever this mode of traction fails at once to release the head from the grip of the brim, or the difficulty lies rather in the size of the head than in the narrowness of the pelvis, I have on several occasions, especially in original head-last labors, found a pump-handle movement very efficient. Made with steady and unremitting traction, and aided by supra-pubic propulsion, it will cause each side of the wedge-shaped head to descend alternately. The range of oscillation should extend from the axis of the outlet anteriorly, to very firm pressure on the coccyx posteriorly. With a very sharply-jutting promontory this up-and-down movement does not usually succeed, unless the parietal bone has been depressed as a whole and not simply indented. Otherwise the sacral side of the head is held fast, and the pubic side will then librate around the indented, and therefore fixed point, merely rising and falling without any onward progress whatever.

As soon as the unflexed head has passed the brim, which it usually does with a well-marked jerk, it is brought into relation with new pelvic diameters. Flexion and rotation now spontaneously take place, and the line of traction must be changed to that of the outlet. And when, finally, the head is about to clear the bony canal, the body of the child should be raised up in front of the pubes, and traction made in a line at right angles to the mother's body.

That the spoon-shaped depressions or even fractures of the sacral side of the child's head are not very dangerous lesions, not only do my own cases show, but also those reported by Simpson, Schroeder, Danyau, Depaul, Blot,* and by many others, the enumeration of whose names would make too long a bead-roll. They are by no means so fatal to life as a lack of promptness on the part of the physician in making efforts at delivery. I have, however, taken for granted that he does not err in this respect. So long as the cord beats, or other signs of life are present, there must be no remission whatever in the extractive efforts of the physician. But if, after the head has become well jammed into the brim, the child is found to be dead and its delivery proves to be a difficult one, due moulding time may be given.

The limit of conjugate narrowing through which the after-coming head of a mature infant may be dragged, cannot be easily determined. Here theory must give place to bedside experience. Numerous are the cases on record in which turning succeeded after the forceps had failed. Simpson† turned and delivered dead children through pelves measuring 2.5 inches and upward in their conjugate diameters. Others have been equally lucky. Schroeder‡ extracted a living child through a conjugate of 2.8 inches; I myself through one of 2.82 inches; and Blot§ through one of three inches, in which Dubois had previously been driven to the cephalotribe. On one of the museum shelves of the Bellevue Hospital Medical College I saw the fractured skull of an infant which Professor Isaac E. Taylor had dragged through a pelvis measuring 2.75 inches. To the above I would add Madame Lachapelle's|| cases in conjugates respectively measuring 2.75, 2.5, 2.25, and 2.2 inches were it not that I distrust the accuracy of that celebrated midwife's statements.

* Archives Générales de Médecine, July, 1863, p. 25.

† Obstetrical Works, vol. i. p. 450.

‡ Manual of Midwifery, Am. ed., 1873, p. 262.

§ Archives Générales de Médecine, July, 1863, p. 19.

|| Pratique des Accouchements, vol. iii., 9th Memoir.

Now, so far as I can judge from the history of these cases, none of the operators, excepting myself, invoked the very substantial help of a propelling force; hence the inference is logical that the conjunction of traction and propulsion offers better results. Thus, in Case VII., these two forces delivered a head through a strait narrowed to 2.5 inches, and bounded at each end by bony projections. From theoretical and clinical deductions two broad rules for guidance in turning may, I think, be laid down: first, that the brim must be narrowed in its conjugate only; and, second, that a brim which can admit the unyielding base of the skull is traversable by the crown. With regard to the first rule, it is self-evident that there must be room enough in the bisiliac diameter of the pelvis for the occipito-frontal diameter of the unflexed head to pass. This diameter is a very hard one to measure; but transverse narrowing may be inferred whenever a strongly flexed head lies obliquely, and yet does not engage or descend. In conjugate narrowing, on the other hand, the head lies transversely, and so extended that the anterior fontanelle sinks lower than the posterior one. The second rule is based on the presumption that the lateral portions of the skull lying above the hard base, being flexible, are reducible to the width of the base. The portion of the base which, according to my observation, first enters the conjugate, and impinges on the promontory, is the hollow lying between the external meatus of the ear and the tubercle of the zygoma. The diameter of the base at this point ranges in length from 2.50 to 3 inches, and to 2.75, their mean, as a minimum, would I, therefore, restrict the operation of version when the infant is mature; provided always that the head is presumptively an average-sized one. Should the head prove to be a small one, a living child may possibly be delivered. If the head be so large that its base cannot enter the brim, then the worst that could happen would be a final resort to craniotomy or to cephalotripsy—measures which would have been initial had the cephalic presentation been retained.

Whether, in these transverse cranial positions, turning has advantages over the application of the forceps to the sides of the child's head, is a question which I have thus far purposely avoided, but on which I now invite discussion. The cases of mature children delivered by the forceps through conjugate diameters not over three inches in length may be counted on the fingers. In straits narrower than this no one has, to my knowledge, ever succeeded. Its effective range, as ordinarily applied, is from a diameter of 3.50 inches to that of a standard pelvis. A diameter of even 3.50 may

compel a resort to the perforator. But, while numerous facts seem to prove that in very narrow pelves the forceps cannot compete with version, I am sure that its range of usefulness can be very materially widened by that cephalic application of the blades, viz., to the sides of the head, which is practised by the best obstetricians of this city. Such an application in these transverse cranial positions, by compelling the greater equitation of the parietal bones, and by shortening the offending lateral diameter of the head, lessens the risk to the mother's tissues, and the power needed for extraction. Also by compressing the least vulnerable portions of the head, it is less likely to cause fatal brain lesions. Yet, even then, the pressure on the mother's tissues is a prolonged one. At best it usually fails to deliver living children through pelves narrowed down to 3.25 inches; while at three inches labor must very generally be ended by craniotomy. Again, in so far as the question of version is concerned, the majority of the arguments urged against the pelvic application of the forceps, holds good against its cephalic application.

Let me not be misunderstood. By no means do I cast off such an old and tried friend as the forceps. It has served me too many good turns to be so illy treated. Cases there are in which turning cannot or should not be performed. Again, the urgency after that operation for immediate delivery is a strong argument against its indiscriminate use. To put these thoughts into practical shape, I offer the following general propositions:—

1. Turning should generally be preferred to the lashing of the forceps handles.

2. In pelves uniformly contracted the forceps is the better means of delivery.

3. In pelves narrowed in the conjugate diameter, turning should be resorted to whenever a half-hour's faithful trial with the forceps fails to make the head engage.

4. In pelves whose conjugates range from 2.75 to 3.25 inches, turning should be the initial step.



